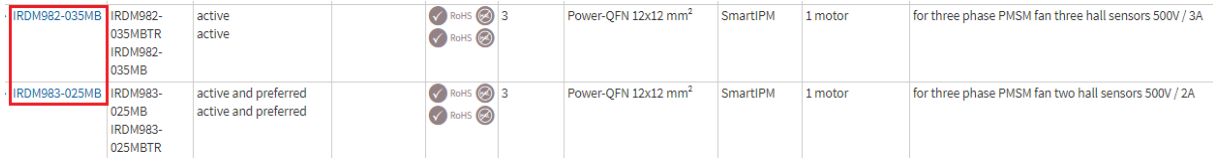
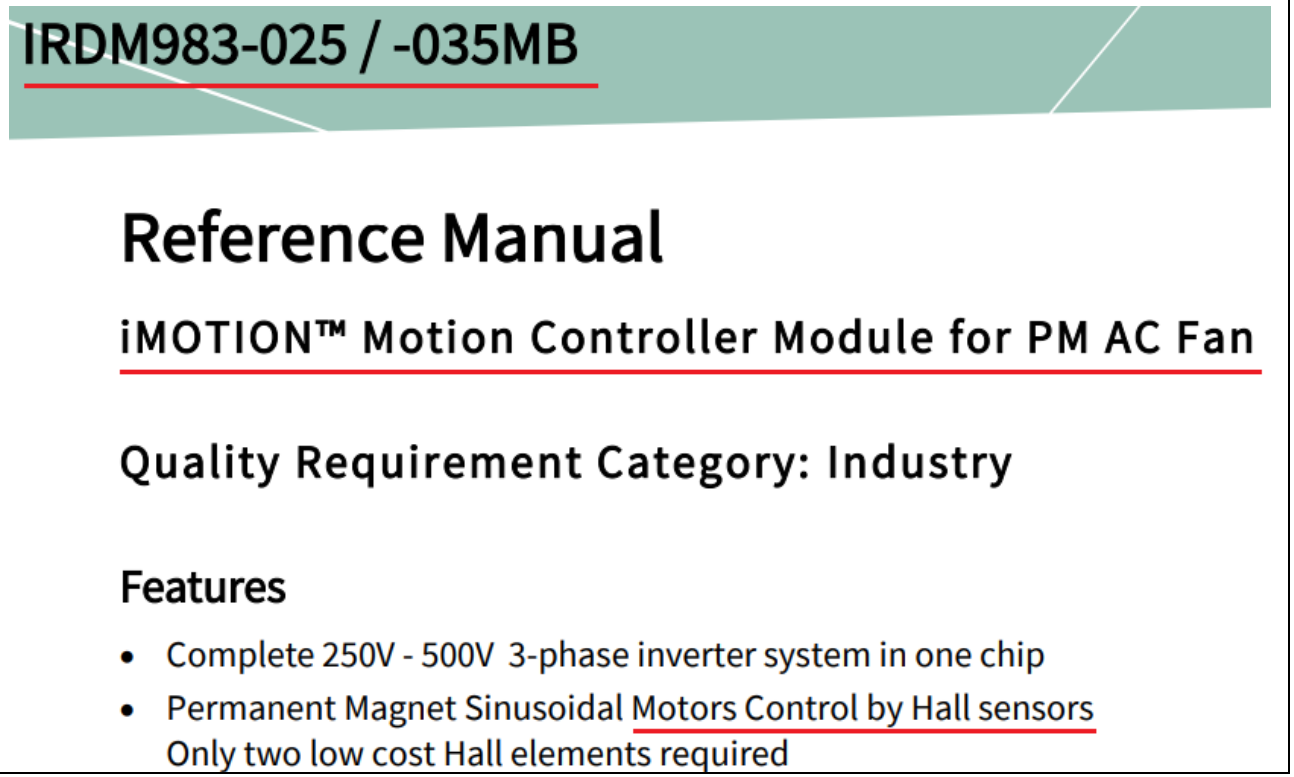
EXHIBIT D

US8018184B2	Infineon iMOTION Motion Controller Module IRDM983-025/035 (“The Accused Product”)
11. A method of generating PWM signals based on an analog sensor output from a sensor provided in a device to be controlled, comprising:	The accused product practices a method of generating PWM signals (e.g., PWM signal to drive a Fan motor) based on an analog sensor output (e.g., Hall sensor output) from a sensor (e.g., Hall sensor) provided in a device to be controlled.



IRDM982-035MB	IRDM982-035MBTR IRDM982-035MB	active active	RoHS RoHS	3	Power-QFN 12x12 mm²	SmartIPM	1 motor	for three phase PMSM fan three hall sensors 500V / 3A
IRDM983-025MB	IRDM983-025MB IRDM983-025MBTR	active and preferred active and preferred	RoHS RoHS	3	Power-QFN 12x12 mm²	SmartIPM	1 motor	for three phase PMSM fan two hall sensors 500V / 2A

https://web.archive.org/web/20170810083036/https://www.infineon.com/cms/en/product/power/motor-control-ics/digital-motor-controller-imotion/channel.html?channel=5546d4624d6fc3d5014d9f028b1c5604



IRDM983-025 / -035MB

Reference Manual

iMOTION™ Motion Controller Module for PM AC Fan

Quality Requirement Category: Industry

Features

- Complete 250V - 500V 3-phase inverter system in one chip
- Permanent Magnet Sinusoidal Motors Control by Hall sensors
  Only two low cost Hall elements required

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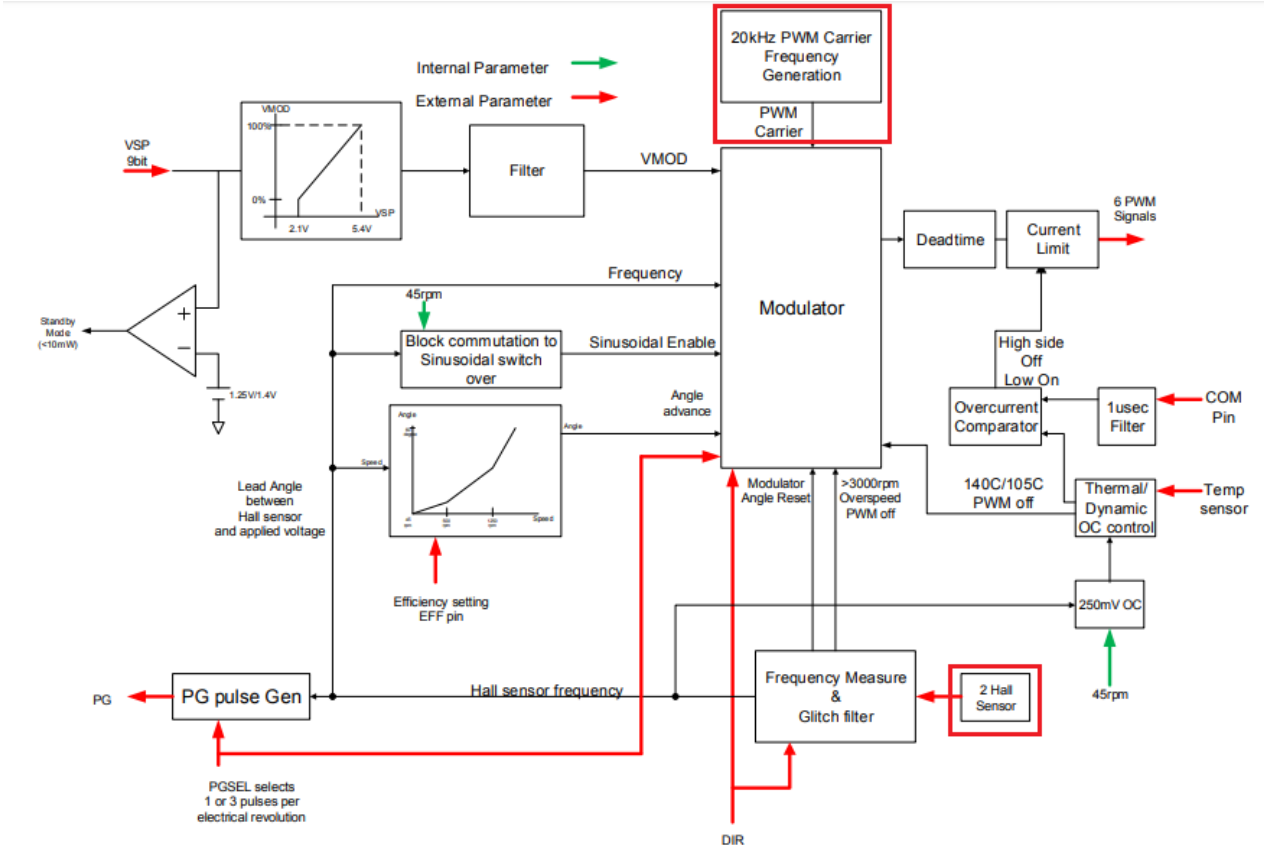
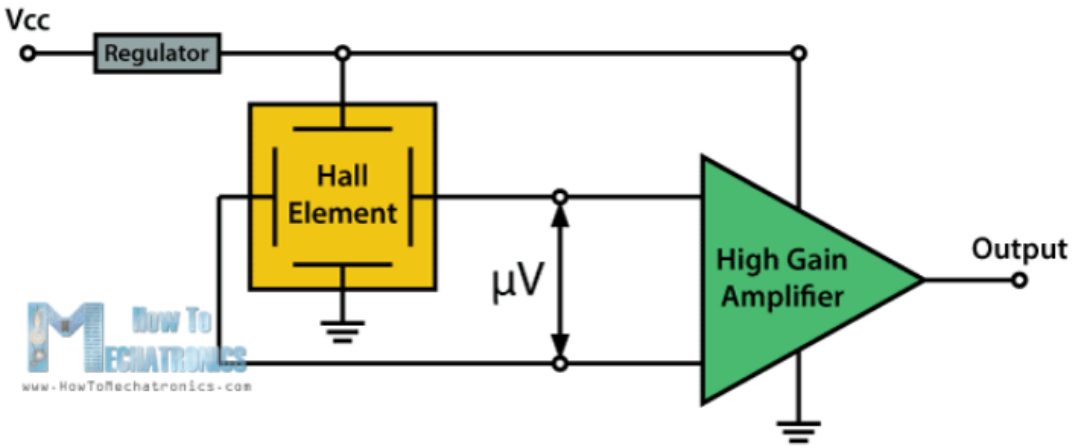
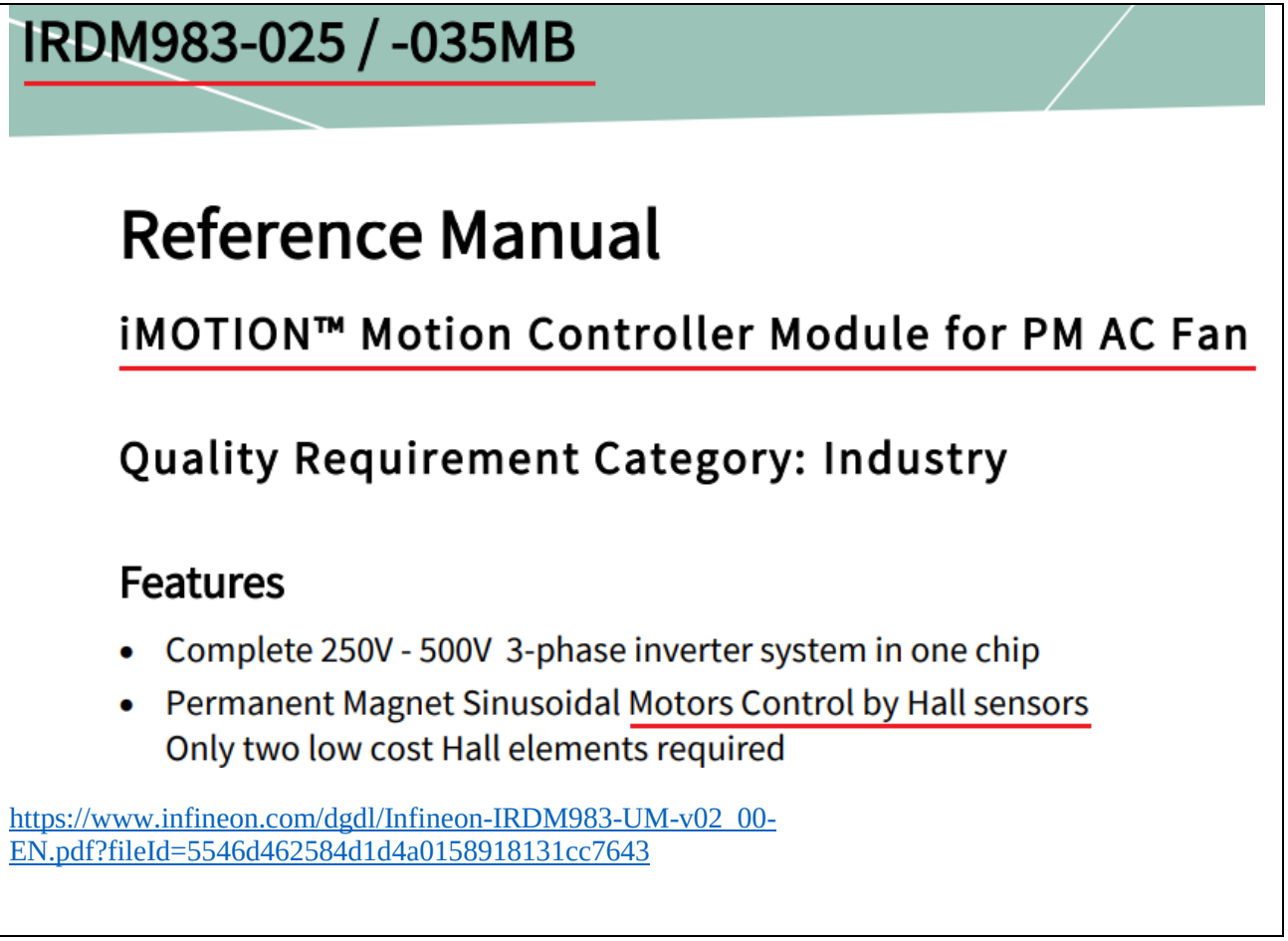


Figure 1.2 Control Block Diagram

https://www.infineon.com/dgdl/Infineon-IRDM983-UM-v02_00-EN.pdf?fileId=5546d462584d1d4a0158918131cc7643

	Hall Effect Sensors The basic Hall Element of the Hall Effect magnetic sensors mostly provides very small voltage of only a few micro volts per Gauss, so therefore, these devices are usually manufactured with built-in high gain amplifiers.  https://howtomechatronics.com/how-it-works/electrical-engineering/hall-effect-hall-effect-sensors-work/
(a) judging positive polarity sections and negative polarity sections of the analog sensor output to generate a polarity signal;	The accused product practices judging positive polarity sections and negative polarity sections (e.g., measure edges of hall sensor input) of the analog sensor output to generate a polarity signal. Upon information and belief, the accused product practices determining edges of hall sensor input (e.g., polarity of hall signal) based on which PWM signal is generated.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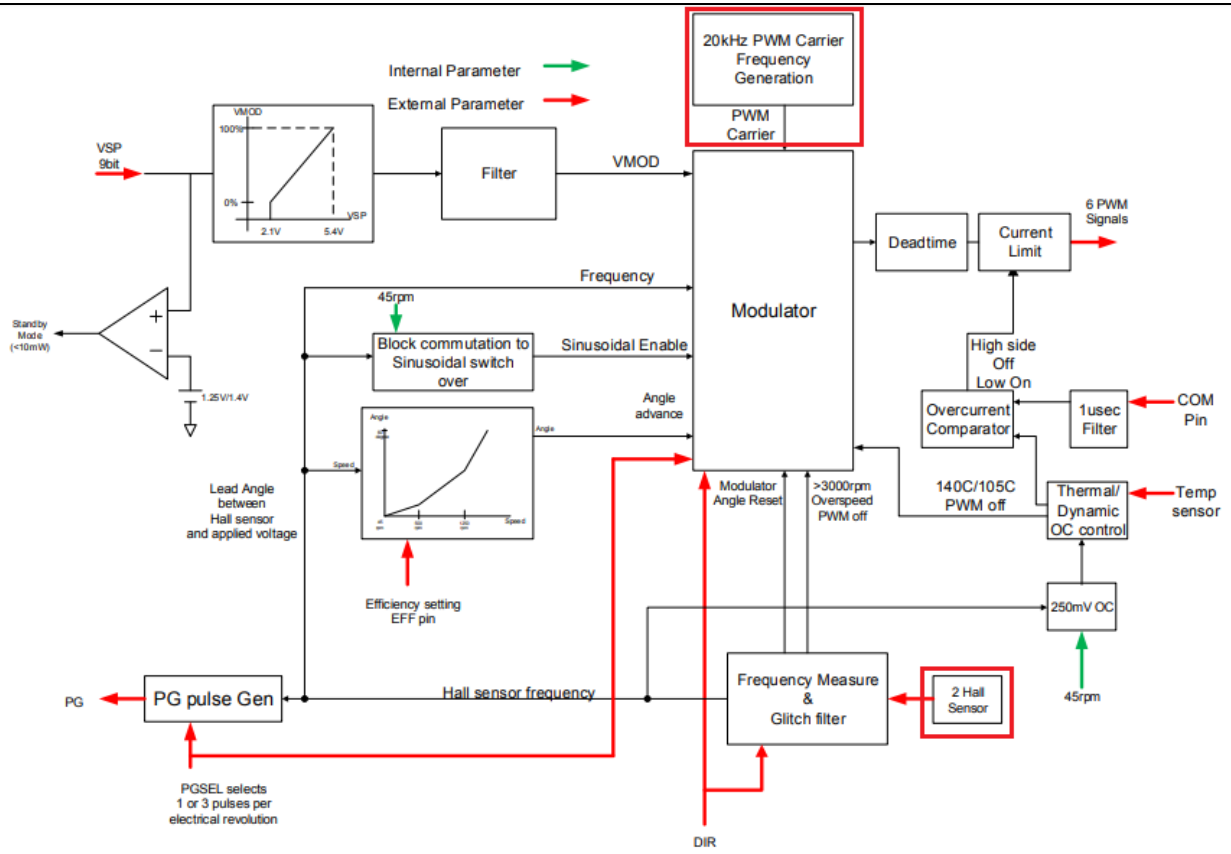

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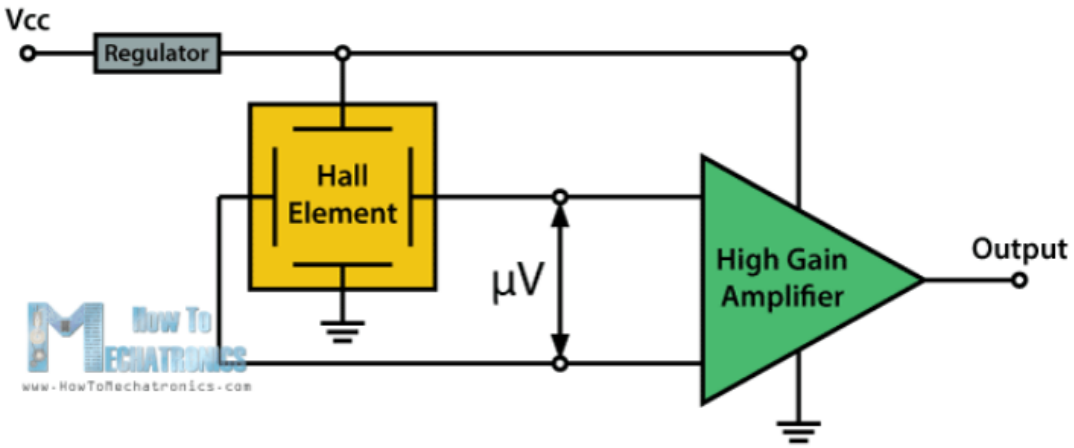
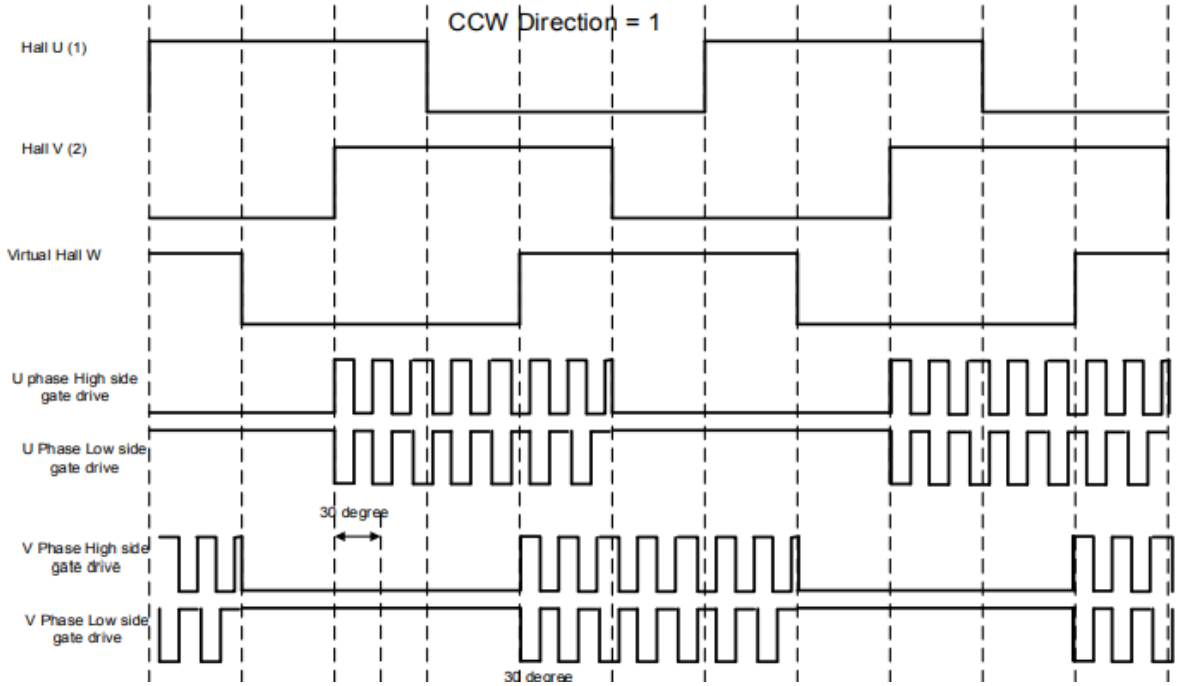
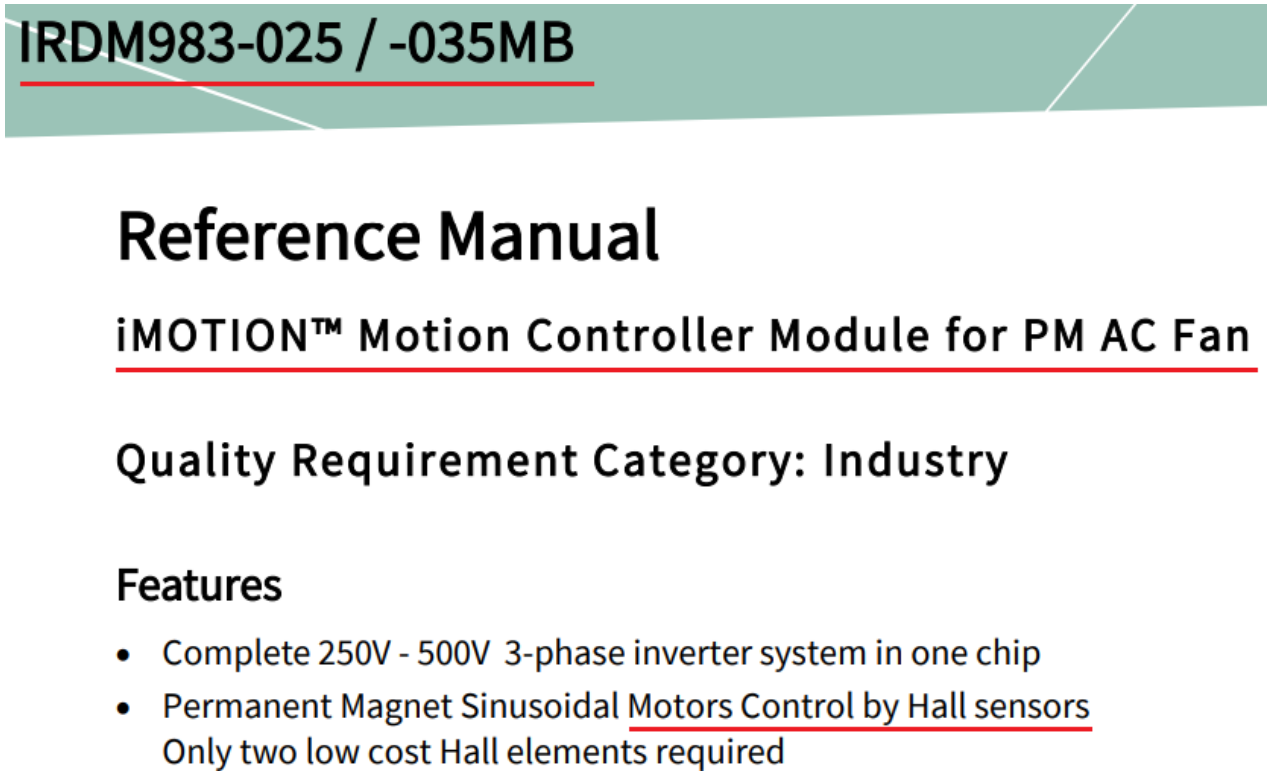
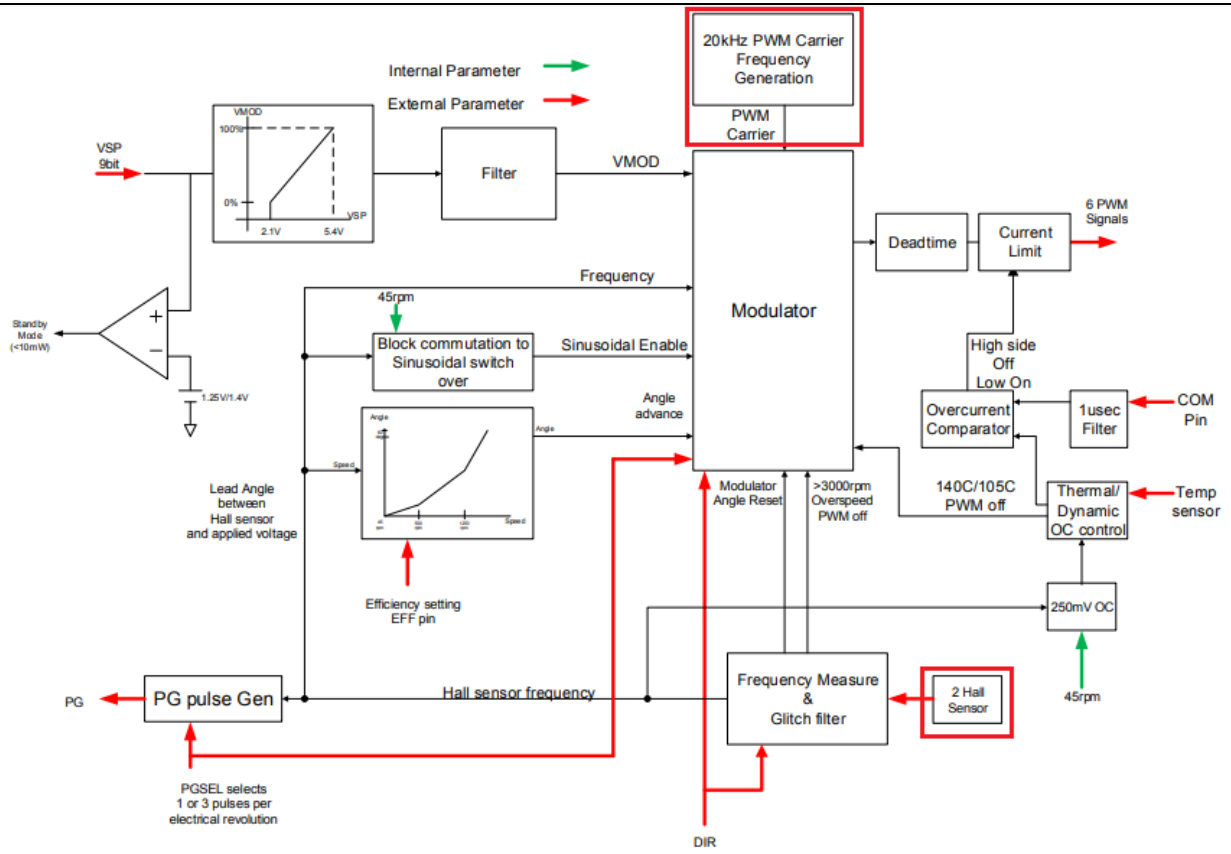
	Hall Effect Sensors The basic Hall Element of the Hall Effect magnetic sensors mostly provides very small voltage of only a few micro volts per Gauss, so therefore, these devices are usually manufactured with built-in high gain amplifiers.  https://howtomechatronics.com/how-it-works/electrical-engineering/hall-effect-hall-effect-sensors-work/

	Transition to/from Block commutation When the speed, measured by hall sensor V (H2) falling edge to falling edge, reaches above 45rpm, a transition occurs and it switches to a two phase SVPWM. This transition is based on the speed measurement by the Hall V" falling edge to falling edge (one electrical revolution) and occurs if speed measurement becomes above 45 rpm by one speed measurement. When the period between 2 adjacent Hall sensors edge changes, that is 60 degrees sector period becomes bigger than 102,7 ms, thus indicating a speed lower than 24,3 rpm for 8 poles motor and 19,5 rpm for 10 poles motor, a transition from 2-phase SVPWM to block commutation occurs.  https://www.infineon.com/dgdl/Infineon-IRDM983-UM-v02_00-EN.pdf?fileId=5546d462584d1d4a0158918131cc7643
(b) generating a full wave rectification signal by doing full	The accused product practices generating a full wave rectification signal by doing full rectification of the analog sensor output (e.g., hall sensor signal).

rectification of the analog sensor output;	Upon information and belief, the accused product generates a full wave rectification signal by doing full rectification of analog sensor output (e.g., hall sensor input). The accused product passes hall sensor input through many digital filters wherein the analog signal of the hall sensor input requires to be rectified for filtering.  https://www.infineon.com/dgdl/Infineon-IRDM983-UM-v02_00-EN.pdf?fileId=5546d462584d1d4a0158918131cc7643



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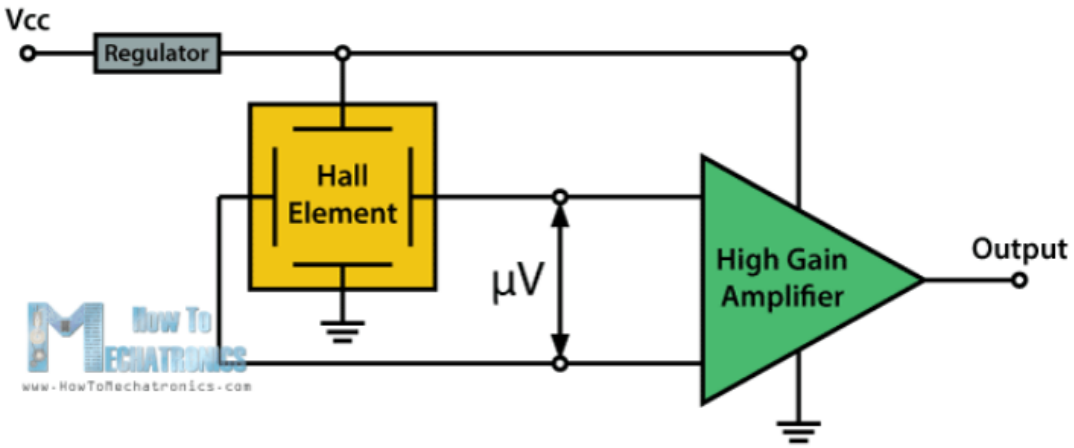
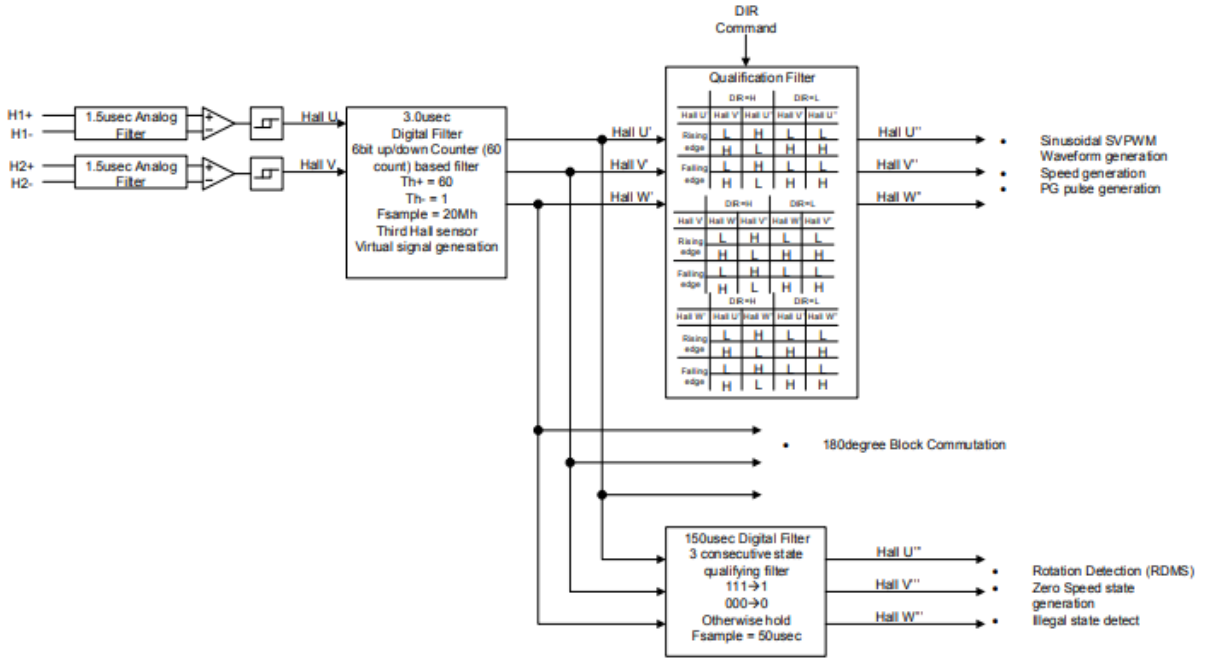
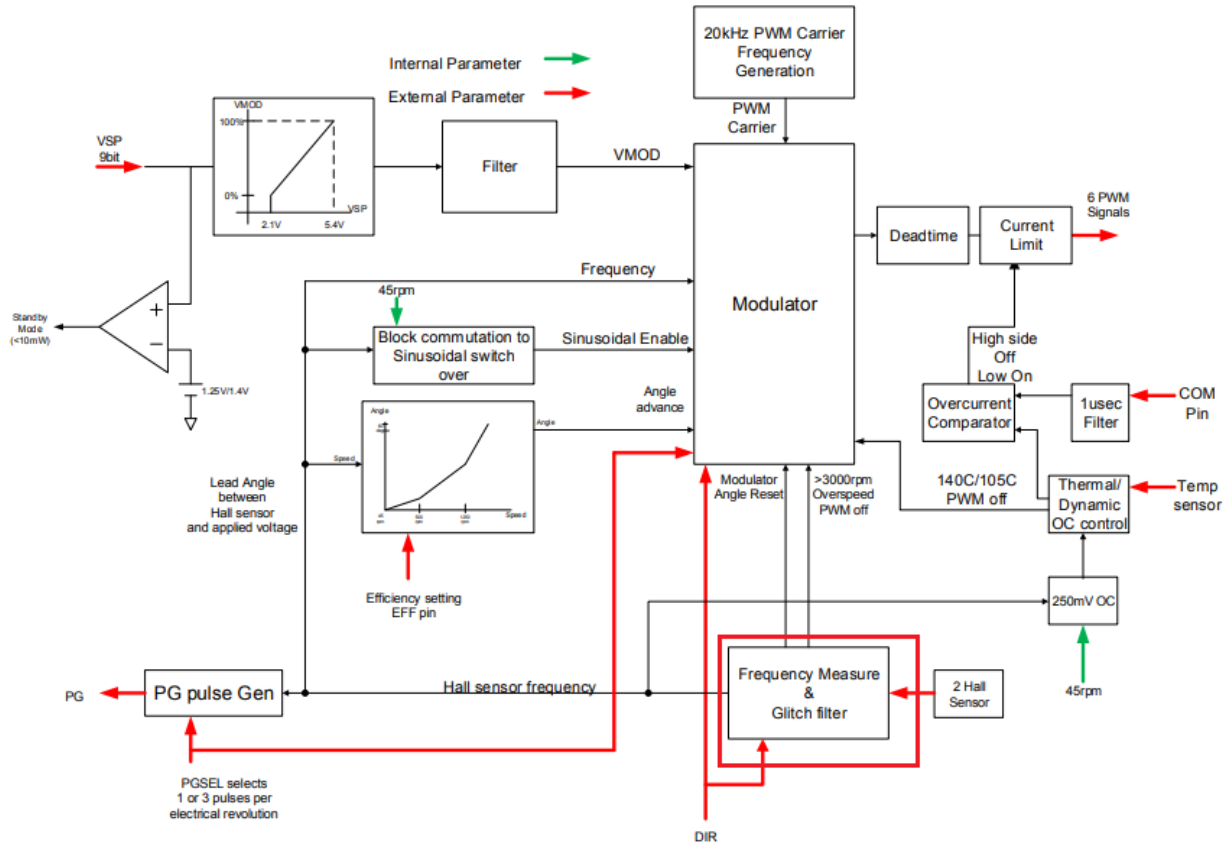
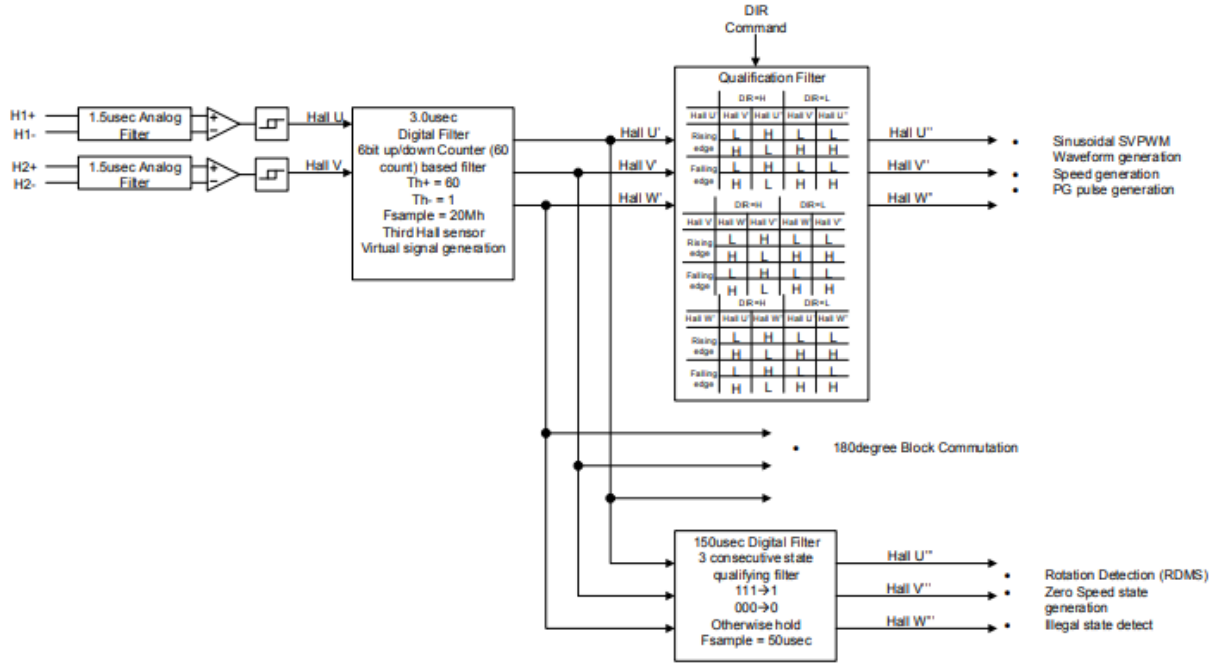
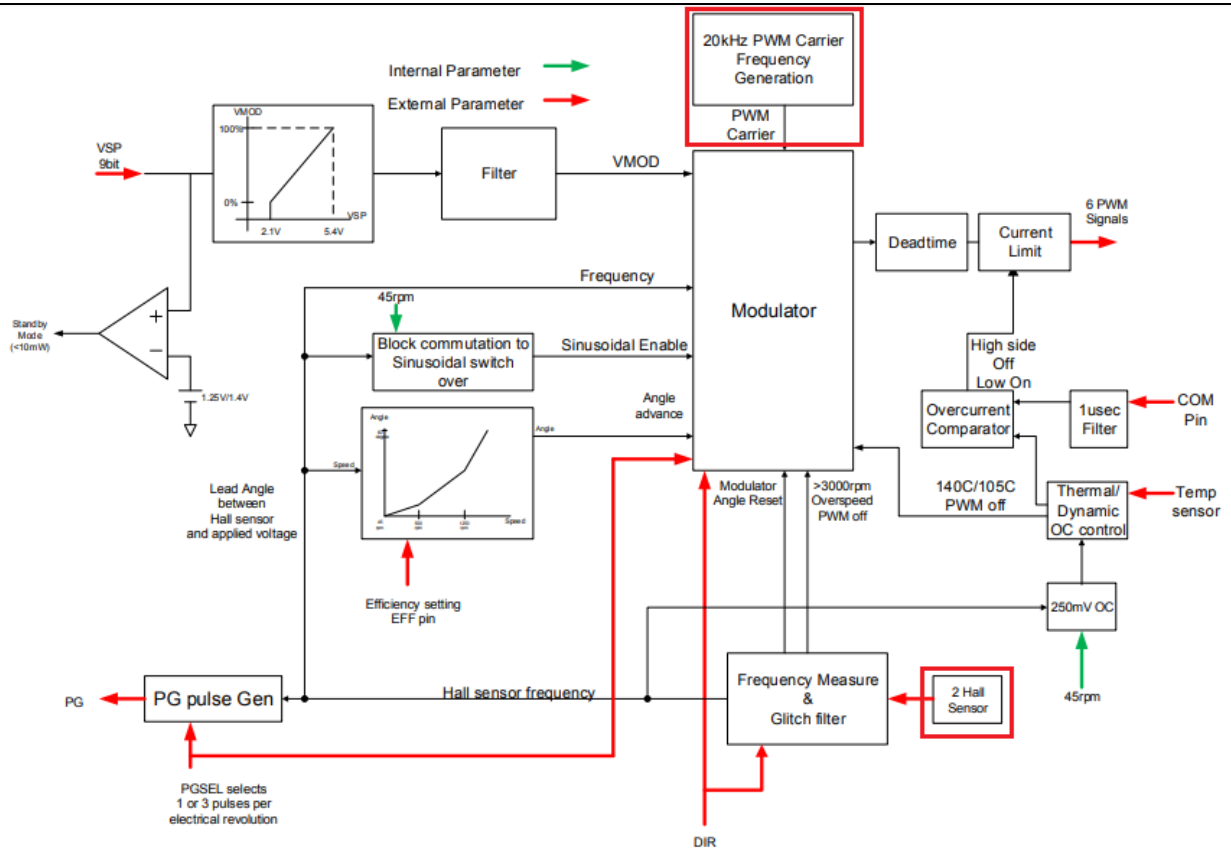
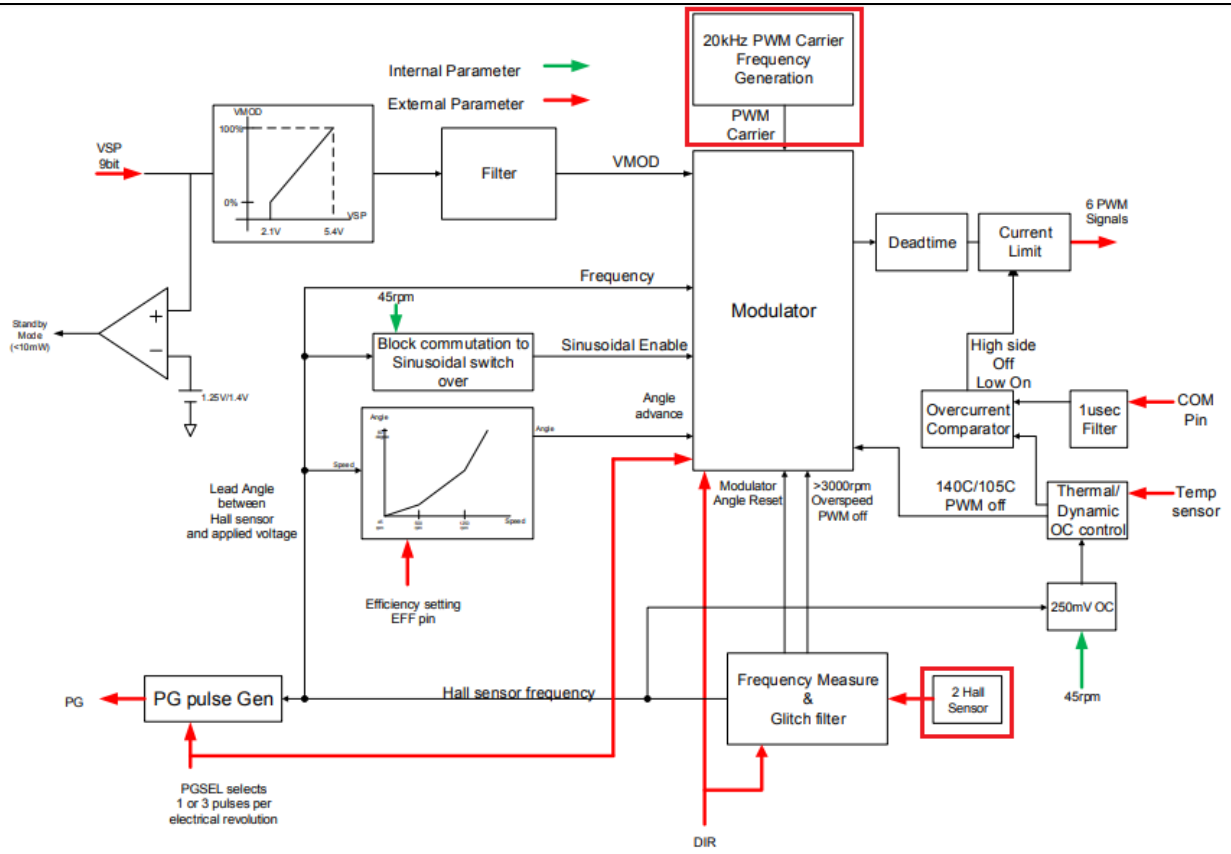
	Hall Effect Sensors The basic Hall Element of the Hall Effect magnetic sensors mostly provides very small voltage of only a few micro volts per Gauss, so therefore, these devices are usually manufactured with built-in high gain amplifiers.  https://howtomechatronics.com/how-it-works/electrical-engineering/hall-effect-hall-effect-sensors-work/

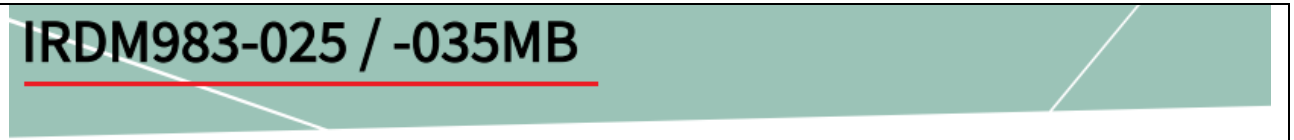
	Two Hall sensor input signals go through multiple stage of digital filtering shown in Figure 3.15. The first stage of digital filter is based on the 20MHz counter to continuously count up to 60 counts to qualify the signal. The U', V', and W' are the filtered signals in Figure below. Then this signal is fed to the qualification filter (Figure 3.16) which further qualifies the Hall input signal by eliminating noise and multiple bouncing signals at a transition. The signal U", V", W" are the qualified signal in Figure and used for sinusoidal two phase SVPWM and speed information generation.  https://www.infineon.com/dgdl/Infineon-IRDM983-UM-v02_00-EN.pdf?fileId=5546d462584d1d4a0158918131cc7643
(c) generating an adjusted waveform signal by adjusting	The accused product practices generating an adjusted waveform signal (e.g., noise filtering) by adjusting waveform of the full wave rectification signal.

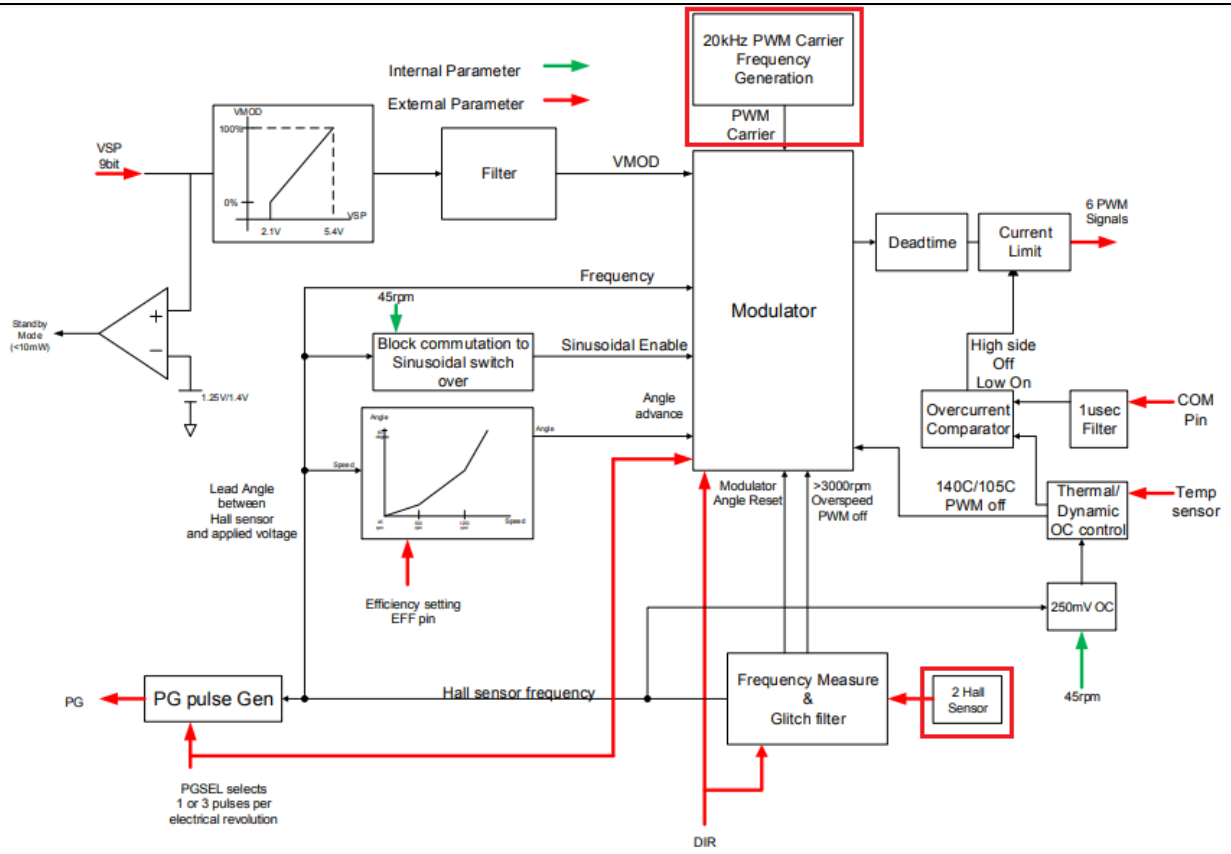
waveform of the full wave rectification signal;	 https://www.infineon.com/dgdl/Infineon-IRDM983-UM-v02_00-EN.pdf?fileId=5546d462584d1d4a0158918131cc7643

	Two Hall sensor input signals go through multiple stage of digital filtering shown in Figure 3.15. The first stage of digital filter is based on the 20MHz counter to continuously count up to 60 counts to qualify the signal. The U', V', and W' are the filtered signals in Figure below. Then this signal is fed to the qualification filter (Figure 3.16) which further qualifies the Hall input signal by eliminating noise and multiple bouncing signals at a transition. The signal U", V", W" are the qualified signal in Figure and used for sinusoidal two phase SVPWM and speed information generation.  https://www.infineon.com/dgdl/Infineon-IRDM983-UM-v02_00-EN.pdf?fileId=5546d462584d1d4a0158918131cc7643
(d) generating a fixed frequency carrier signal;	The accused product practices generating a fixed frequency carrier signal (e.g., a PWM carrier signal).

	 ***Figure 1.2 Control Block Diagram*** https://www.infineon.com/dgdl/Infineon-IRDM983-UM-v02_00-EN.pdf?fileId=5546d462584d1d4a0158918131cc7643
(e) generating an original PWM signal by comparing the adjusted waveform signal and the carrier signal; and	The accused product practices generating an original PWM signal (e.g., a PWM signal) by comparing the adjusted waveform signal (e.g., filtered hall sensor input signal) and the carrier signal (e.g., a PWM carrier signal).

	 ***Figure 1.2 Control Block Diagram*** https://www.infineon.com/dgdl/Infineon-IRDM983-UM-v02_00-EN.pdf?fileId=5546d462584d1d4a0158918131cc7643
(f) generating a first PWM signal for the positive polarity section and a second PWM signal for the negative polarity section, by shaping the original PWM signal	The accused product practices generating a first PWM signal (e.g., PWM high gate drive signals) for the positive polarity section and a second PWM signal (e.g., PWM low gate drive signal) for the negative polarity section, based on the polarity signal and the adjusted waveform signal.

according to the polarity signal.	 **Reference Manual** **iMOTION™ Motion Controller Module for PM AC Fan** **Quality Requirement Category: Industry** **Features** • Complete 250V - 500V 3-phase inverter system in one chip • Permanent Magnet Sinusoidal Motors Control by Hall sensors Only two low cost Hall elements required https://www.infineon.com/dgdl/Infineon-IRDM983-UM-v02_00-EN.pdf?fileId=5546d462584d1d4a0158918131cc7643



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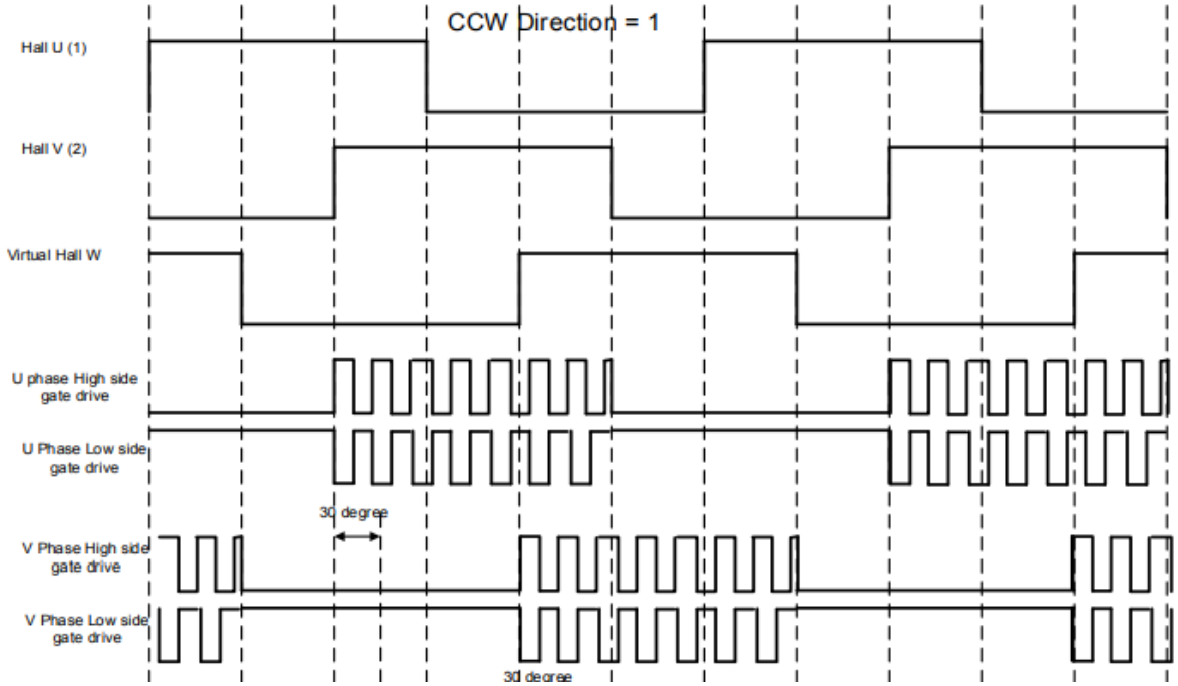

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